

REMARKS

Status of Claims

Claims 1–4, 6, 9–24, 26, 29–34, 36, and 39–40 were pending and were rejected. No claims are amended herein. Claims 1–4, 6, 9–24, 26, 29–34, 36, and 39–40 remain pending. Reconsideration and withdrawal of the rejections are requested in view of the following remarks.

Introduction

Applicants appreciate Examiner’s agreement that the previous rejection based on Chiu in view of Divakaraan was improper. However, it is respectfully submitted that the newly proposed rejection over Gonzales in view of Chiu is fatally defective in exactly the same way, namely because Gonzales and Chiu, whether separately or in combination, fail to teach or suggest numerous limitations of the pending claims.

Rejection Under § 103

Claims 1–4, 6, 9–24, 26, 29–34, 36, and 39–40 were rejected under 35 U.S.C. § 103(a) as obvious over U.S. Patent 5,231,484 to Gonzales et al. (“Gonzales”) in view of U.S. Patent 6,360,017 to Chiu et al. (“Chiu”). The following remarks address independent claim 1 only. However, each independent claim includes similar limitations and is therefore allowable for at least the same reasons. Similarly, the dependent claims each incorporate such limitations from the corresponding independent claim and are therefore also allowable.

An obviousness rejection centers around three factual inquiries: (1) determining the scope and content of the prior art; (2) ascertaining the differences between the claimed invention and the prior art; and (3) determining the level of ordinary skill in the art. *Graham v. John Deere Co.*, 383 U.S. 1, 148 U.S.P.Q. 459 (1966). See also MPEP § 2141(II). In the present application, the vast differences between the claimed invention and the cited art preclude any finding of obviousness.

Claim 1 recites the following:

1. A method implementable on an encoder for adjusting a coding threshold for encoding a block in an image, wherein the coding threshold determines whether the block should be coded, comprising:
 - encoding, at a first time, a first image representation of the block using first encoding parameters generated by the encoder;
 - encoding, at a second time later than the first time, a second image representation of the block using second encoding parameters generated by the encoder;
 - assessing at least the first and second encoding parameters to determine whether the image is likely stationary, wherein the first and second encoding parameters comprise at least first and second quantization parameters; and
 - if the image is likely stationary, adjusting the coding threshold in the encoder for at least a portion of the block.

An obviousness rejection requires that the claim be considered in its entirety. MPEP § 2141.02(I). In the case of claim 1, the claim includes numerous limitations that are neither taught nor suggested by either Gonzales or Chiu, whether separately or in combination.

Claim 1 was rejected as follows:

Gonzales disclose a method implementable on an encoder for adjusting a coding threshold for encoding a block in an image (Gonzales: column 24, lines 17-36), comprising:
encoding, at a first time, a first image representation of the block using first encoding parameters generated by the encoder (Gonzales: column 10, lines 30-40); encoding, at a second time later

than the first time, a second image representation of the block using second encoding parameters generated by the encoder (Gonzales: column 14, lines 50-67); assessing at least the first and second encoding parameters to determine whether the image is likely stationary (Gonzales: column 15, lines 40-54), wherein the first and second encoding parameters comprise at least first and second quantization parameters (Gonzales: column 16, lines 20-45); and if the image is likely stationary, adjusting the coding threshold in the encoder for at least a portion of the block (Gonzales: column 20, lines 45-60), as in claim 1. However, Gonzales fails to disclose using the coding threshold to determine whether the block should be coded or not. Chiu discloses a video coding method including a pre-processing element which executes the option of not coding (Chiu: column 9, lines 25-35; skipping encoding of macroblocks) in order to save the computational load on the available resources of the encoder (Chiu: column 9, lines 1-10).

Accordingly, given this teaching, it would have been obvious for one of ordinary skill in the art to incorporate the Chiu skipping step into the Gonzales method in order to convey the advantage of alleviating the computational burdens associated with encoding processing to the method of the primary reference. The Gonzales method, now incorporating the Chiu skipping step, has all of the features of claim 1.

Office Action Mailed April 14, 2008 at 2-3. This rejection is not-well founded for at least the following reasons.

First, the rejection is defective because the combination of Gonzales and Chiu fails to teach or suggest “a method . . . for adjusting a coding threshold for encoding a block in an image, wherein the coding threshold determines whether the block should be coded....” The rejection cites Gonzales at col. 24, ll. 17-36 as teaching this limitation. The entire text of Gonzales cited is reproduced below:

We claim:

1. A method for the allocation of bits to be used to compression code digital data signals representing a set of pictures in a motion video sequence, comprising the steps of:
20 identifying each picture in said set to be compression coded as one of three types I, P, B;
25 determining the total number of bits to be used in compression coding said set of pictures based on a fixed target bit rate for said sequence; and
30 allocating from said total number of bits, bits for use in compression coding a picture in said set by determining the allocations for each picture type in the set prior to compression coding each picture, using 1) the degree of difficulty of compression coding each picture type, and 2) the known numbers of each of the three picture types in said set, to
35 produce allocations which meet said fixed target bit-rate.

This claim appears to relate to a method of allocating a number of bits to encoding an image. As can be clearly seen, nothing in this passage teaches or suggests anything about adjusting a coding threshold. Thus, there is no evidence that Gonzales teaches “a method ... for adjusting a coding threshold for encoding a block in an image, wherein the coding threshold determines whether the block should be coded...” as recited in claim 1. Therefore, the rejection of claim 1 as obvious over Gonzales in view of Chiu is improper.

Second, Gonzales and Chiu fail to teach or suggest “encoding at a first time, a first image representation of the block” and “encoding, at a second time later than the first time, a second image representation of the block,” the first two elements of claim 1. The rejection cites Gonzales at col. 10, ll. 30–40 as teaching the first encoding and Gonzales at col. 14, ll. 50–67 as teaching the second encoding. The entirety of these cited passages are reproduced below.

Turning to the invention, a block diagram of an MPEG encoder incorporating three component subsystems for implementing the above-mentioned techniques in accordance with the present invention is shown in FIG. 6. As seen in Figure, to begin with, picture data P_k representative of the k-th picture in a sequence enters one subsystem, QP-adaptive Pre-processor 3, where pre-processing may take place if appropriate. The nature of the pre-processing is controlled by quantization levels (QP_{pres}) of previously coded pictures, which will have been previously communicated to subsystem 3 from Adaptive-quantizing Rate-controlled (AQ/RC) Picture Coder 1, in the coarse of coding the data sequence. The possibly pre-processed picture data F_k

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AQ/RC Picture Coder

Turning now to the AQ/RC Picture Coder 1, this subsystem involves procedures for the adaptive quantization (AQ) of the successive pictures of a video sequence to achieve improved visual quality, while ensuring that the number of bits used to code each picture is close to a predetermined target. Procedures are performed for I-pictures, P-pictures, and B-pictures. These procedures involve treating the spatial regions making up a picture using a region classification strategy which works in tandem with:

motion estimation;

an adaptive model of the number of bits required to code a picture region as a function of the quantization factor QP and measured characteristics of the region; and,

a scheme for adapting the quantization level as a picture is coded to ensure that the overall number

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As regards the first element reciting encoding a block at a first time, the cited passage (*i.e.*, col. 10, ll. 30–40) describes pre-processing of the image. It does not describe encoding a block at a first time. In any case, the second cited passage (*i.e.*, col. 14, ll. 50–67) certainly does not describe coding a second representation of the same block at a second time. This second passage

appears to describe adapting a quantization parameter in conjunction with a rate control algorithm to maximize video quality while staying within a constrained number of bits. Moreover, it is clear from apparent lack of any sort of temporal relationship between the two passages cited above that they do not relate to “encoding at a first time...” and “encoding at a second time....” Because the combination of Gonzales and Chiu do not teach or suggest coding first and second representations of an image block at two different times, the rejection of claim 1 is improper.

Third, the rejection is defective because the combination of Gonzales and Chiu fails to teach or suggest “assessing at least the first and second encoding parameters to determine whether the image is likely stationary, wherein the first and second encoding parameters comprise at least first and second quantization parameters.” The rejection in the office action impermissibly splits this limitation into two pieces, thus failing to consider the claim as a whole. *See MPEP § 2141.02.* The rejection proposes Gonzales at col. 15, ll. 40–54 as teaching the first portion of this limitation, i.e., “assessing at least the first and second encoding parameters to determine whether the image is likely stationary....” The cited passage is reproduced below in its entirety.

Motion Estimation and MB Classification Unit

One of the primary purposes of the Motion Estimation and MB Classification unit 14 is to determine which 40 coding mode $m(r,c)$ will be used to code each MB in a picture. This function is only used for motion compensated pictures, since there is only one mode for MB's in I-pictures: intramode. The mode decision relies on a motion estimation process, which also produces motion 45 vectors and motion-compensated difference MB's. Another important function of the Motion Estimation and MB Classification unit 14 is to classify each MB. The class $cl(r,c)$ of MB (r,c) will ultimately determine the value of the quantization factor $QP(r,c)$ used to code 50 that MB. The modes and classes are determined by analyzing each picture, and estimating the motion between the picture to be coded and the predicting picture(s). The same information is also used to compute the coding difficulty factor, D_k , which is passed to the 55 Picture Bit Allocation subsystem 2.

Again, it can be plainly seen that the cited passage bears little, if any, relationship to the limitation at issue. This passage seems to be addressing the use of motion estimation to determine a coding mode and to determine the quantization parameter. Because this passage describes motion analysis to determine a quantization parameter, it cannot teach or suggest “assessing at least the first and second encoding parameters to determine whether the image is likely stationary, wherein the first and second encoding parameters comprise at least first and second quantization parameters.” Even a cursory analysis of this claim language will show that the claim requires assessing the quantization parameter as part of the determination of whether the image is stationary. In short, this passage contains no assessment of encoding parameters, including a quantization parameter, to determine whether the block is stationary.

The rejection cites Gonzales at col. 16, ll. 20–45 as teaching the second portion of this limitation, *i.e.*, the limitation requiring that one of the encoding parameters considered in determining whether the block is stationary include a quantization parameters. The complete text of this passage is reproduced below.

20 success of motion compensation (motion compensation error), that indicates how good the match is between the MB being compensated and the predicting region pointed to by the motion vector, can be made available. It will be recalled that for P-pictures, there is one type
25 of motion estimation (forward-in-time), and for B-pictures there are three types (forward-in-time, backward-in-time, and interpolative-in-time). The forward motion vector for MB (r,c) may be denoted as $mv_f(r,c)$, and the backward motion vector as $mv_b(r,c)$. The interpolative mode uses both forward and backward vectors. The
30 forward, backward, and interpolative motion compensation errors may be denoted as $\Delta_{mc,f}(r,c)$, $\Delta_{mc,b}(r,c)$, and $\Delta_{mc,i}(r,c)$, respectively.

In addition to the motion compensation error(s), a
35 measure of the spatial complexity of each MB is needed. Denote this measure as $\Delta(r,c)$. It is important that $\Delta(r,c)$, $\Delta_{mc,f}(r,c)$, $\Delta_{mc,b}(r,c)$, and $\Delta_{mc,i}(r,c)$, are like measures, in the sense that numerical comparison of them is meaningful. In the preferred embodiment, these measures
40 are all defined to be mean absolute quantities, as indicated below. Labeling each MB by its row and column coordinates (r,c) , denotes the luminance values of the four 8×8 blocks in MB (r,c) by $y_k(i,j)$, $i=0, \dots, 7$, $j=0, \dots, 7$, $k=0, \dots, 3$ and the average value of
45 each 8×8 block by dc_k . Then, the spatial complexity measure for MB (r,c) is taken to be the mean absolute difference from DC, and is given by

Nothing in this passage describes assessing encoding parameters, including a quantization parameter, to determine whether the block is stationary. Thus, the cited passages fail to teach or suggest “assessing at least the first and second encoding parameters to determine whether the image is likely stationary, wherein the first and second encoding parameters comprise at least first and second quantization parameters.” In fact, Gonzales and Chiu in their entirety fail to teach or suggest this limitation. Therefore the rejection of the claims as obvious over Gonzales in view of Chiu is improper.

Fourth and finally, the rejection is defective because the combination of Gonzales and Chiu fails to teach or suggest “if the image is likely stationary, adjusting the coding threshold in the encoder for at least a portion of the block.” The rejection relies on Gonzales at col. 20, ll. 45–60 as teaching this limitation. However, Examiner then concedes that Gonzales fails to teach or suggest using the coding threshold to determine whether the block should be coded or not, and relies on Chiu at col. 9, ll. 1–10 and 25–35 as teaching this limitation. The cited portion of Gonzales is reproduced below in its entirety.

45 match the expected number. It is desired to control this deviation, not only to keep the actual bits produced for the picture close to the target, but also to prevent violation of the VBV bit-rate limitations. A rate control feedback strategy has been developed in accordance
50 with the invention which updates QP_{low} at the end of each row of MB's. A number of factors determine the update. One factor is that different rows of MB's in a picture are not expected to produce the same number of bits, because of variations in $\Delta(r,c)$ and $\Delta_{mc}(r,c)$, as well
55 as assigned quantizer step sizes. At the end of each row, the number of bits produced is compared to the expected number $T(r)$ computed in the QP-level Set unit
15. Another factor which plays a role in updating QP_{low} is the closeness of both the picture allocation and the
60 actual number of bits produced to the VBV limits. The

This passage appears to relate to a rate control technique that adjusts a quantization parameter (which is fundamentally different from a coding threshold) to achieve a desired bitrate. This passage does not describe anything related to adjusting a coding threshold if it has been determined that the image is likely stationary. Thus, Gonzales cannot teach or suggest “if the image is likely stationary, adjusting the coding threshold in the encoder for at least a portion of the block.”

The two cited passages of Chiu are also reproduced below.

value, then that macroblock is not subjected to motion estimation/compensation. This results in a segmentation of a frame into macroblocks that have changed a visually perceptible amount from the previous frame and macroblocks that have not changed a visually perceptible amount from the previous frame. As a result, the computational effort otherwise associated with motion estimation/compensation of that macroblock is saved or may be allocated to motion estimation/compensation of another macroblock or some other encoder processing function. It is to be appreciated that

sated. The output signal is also provided to the transformer 116, which then informs the other affected components of the encoder 100 (i.e., quantizer 118, entropy encoder 120, etc.), that a particular macroblock is not to be processed thereby. That is, once a macroblock is identified as one to be skipped, the macroblock is not motion estimated/compensated and therefore the transformer 116, the quantizer 118, and the entropy encoder 120 do not process data associated with that particular macroblock.

It should be understood that an encoder implementing these inventive compression techniques then need only transmit or store motion vectors for those macroblocks that are motion compensated, that is, those macroblocks that have been identified as having changed a visually perceptible degree from a corresponding macroblock of the previous frame. Advantageously, a corresponding video decoder

As with the Gonzales passage described above, nothing in either of these passages teaches, suggests, or in any way relates to “if the image is likely stationary, adjusting the coding threshold in the encoder for at least a portion of the block.” These two passages of Chiu appear to relate to identifying unchanged macroblocks and skipping the encoding of these unchanged macroblocks. Conversely, the claims of the present application require encoding the macroblock not once, but twice, and analyzing the coding parameters to determine if the block is stationary (as opposed to unchanged) and adjusting a coding threshold if the block is stationary. Chiu’s teaching of skipping unchanged macroblocks does not at all relate to this method step. Moreover, nothing in Gonzales or Chiu has anything at all to do with adjusting a coding threshold. Therefore, because Gonzales and Chiu fail to teach or suggest “if the image is likely stationary, adjusting the coding threshold in the encoder for at least a portion of the block,” the rejection is improper.

Because the proposed combination of Gonzales and Chiu fails to teach or suggest numerous limitations of the pending claims, the rejection of these claims as obvious over these references is improper. Although it is not necessary to address the proposed rationale for combining Gonzales and Chiu, we note that Examiner's proposed rationale is improper. Specifically, the Examiner states that "it would have been obvious for one of ordinary skill in the art to incorporate the Chiu skipping step into the Gonzales method in order to convey the advantage of alleviating the computational burdens associated with the encoding processing to the method of the primary reference."

This purported rationale completely ignores the fact that the claims expressly recite that the blocks in question are encoded twice, and that the net result is not a reduction in present computational burden at the present time, but rather a change in a coding threshold that prevents a block from being coded in the future for aesthetic reasons. The purported rationale is therefore improper at least because it renders the prior art unsuitable for its intended purpose and changes the operating principle of the prior art.

Conclusion

In summary, the claims require: (1) coding a block, at a first time, using first coding parameters; (2) coding the block again, at a second, subsequent time, using second coding parameters; (3) assessing the first and second coding parameters, including at least first and second quantization parameters to determine whether the image is likely stationary; and (4) if the image is likely stationary, adjusting a coding threshold. The differences between these claims and the cited art, which have nothing at all to do with adjusting a coding threshold in response to a likely stationary image, are so substantial as to preclude a finding that the claims are obvious over the cited art. In view of the foregoing, withdrawal of the rejections and a Notice of Allowance for all pending claims are requested.

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Respectfully submitted,

August 14, 2008

Date

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